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Prediction of Grade Point Average and Selected Course Grades from American College Testing Program Scores and Status as High School Graduate.

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This study reports an attempt to determine the nature and extent of relationships between total grade point average and grades in selected courses with ACT scores and the students' status as high school graduates. In general, it was found that the predictors for individual courses were more accurate than predictors for grade point averages. A correlation of about .60 appears to be the highest that can be expected when grades and grade point averages are the criteria. Conclusions include the warning that there is no philosophical reason to expect or desire a high degree of predictability of grades and grade point averages from ability measures. Low correlation coefficients on these measures may well indicate that the college is providing appropriate programs. A low multiple correlation could also mean that there is not a linear relationship between the criterion, grade point average, and the predictors. (JC)

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DALLAS COUNTY JUNIOR COLLEGE DISTRICT

RESEARCH STUDY 68-3

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RESEARCH STUDY 68 - 3

TITLE: Prediction of Grade Point Average and Selected Course Grades from American College Testing Program Scores and Status as Highschool Graduate

OBJECTIVE: To determine the nature and extent of relationships between the dependent variables (1) total grade point average, (2) grades in selected courses and the predictor variables (1) ACT scores and (2) status as high-school graduates.

PROCEDURE: All students active at the end of the Fall, 1967, semester with ACT scores were considered as the sample. For those with attempted semester hours, a grade point average was computed. Students who had enrolled in selected courses (see Table 1) were identified, so that the grade earned might be studied. A multiple linear regression equation was computed using GPA and course grades as the dependent variable and the ACT sub-scores as predictors. ACT composite scores were correlated with GPA and course grades to compare the relative predictive effectiveness of individual ACT sub-scale scores versus the composite score. A single classification analysis of variance was computed for high school graduates and non-high school graduates using the same criterion measures.

RESULTS: Table 1 records the basic statistics for this analysis.

Each row in Table 1 represents a separate analysis performed on a sample selected from the tape. The first column indicates the criterion measure for the sample. For example, the first sample consisted of all those students who had attempted one or more courses. The second analysis consisted of all those students who had taken English 101 and the criterion was the grade earned (A = 4 grade points). The second column indicates the number of students for which the analysis was performed. Columns three through eight report the relevant statistics for the analyses wherein the criterion was predicted by the four spearate ACT scales. Column three indicates the multiple correlation coefficient produced by the analysis. Columns four through eight, respectively, report the regression coefficients and regression constant by which the criterion can be predicted. For example, for a student with ACT scores of 10, 11, 13, and 14, in English, Math, Social Science, and Natural Science respectively, the predicted grade in English 101 would be 10 (.06) + 11 (.01) + 13 (.03) + 14 (-.01) + .10 = 1.06 (a "D").

Columns nine through eleven report the relevant statistics by which the criterion measures can be predicted from the ACT composite score. Column nine reports the product moment correlation between the ACT composite score and the indicated criterion. Since prediction from this single measure is

less accurate than prediction from the four sub-scales, these correlations are all less than the multiple correlation coefficient in column three. Asterisks in this column indicate that the product moment correlation is significantly less than the multiple correlation coefficient at the .05 level of significance. Columns ten and eleven indicate the regression weight and regression constant by which the criterion can be predicted from the ACT composite. For example, for the student previously mentioned, who would have an ACT composite score of 12, his predicted grade in English 101 would be 12 (.10) + 20 = 1.40 (a "D+").

Ninety-five per cent of the students for which grade point averages were computed were high school graduates. Although this statistic varies for the sub-samples who took specific courses, the variation is slight, ranging from 93 to 97 per cent. Column twelve reports the difference between the mean criterion score for high school graduates and the mean criterion score for non-high school graduates. A positive number indicates that the high school graduates had the higher mean score and a negative number indicates that the non-high school graduates had the highest mean score. Asterisks indicate that these differences are significant at the .05 level. Column thirteen reports the mean criterion score for each sample and column fourteen reports the standard deviation for each sample.

If predictions are to be made for individual students, based on these statistics, the most accurate predictions can be obtained by using the four ACT sub-scales as predictors. If this is to be done, an estimate of the accuracy of prediction is useful, in order to judge how much confidence may be placed in the predictions. The last column reports the standard error of estimate for each criterion, which provides a way of making this judgment. The standard error of estimate may be interpreted as follows: for any predicted criterion score, approximately two-thirds of the actual criterion scores will fall within a range of the predicted score plus or minus the standard error of estimate. For example, assume that a grade point average of 2.0 has been predicted for 100 new students. The actual grade point averages later earned by these students might range anywhere from 0.0 to 4.0. For approximately two-thirds of the students, or about 67 of them, we would expect that their actual earned grade point averages would range from 1.25 up to 2.75.

The standard error of estimate may also be interpreted in the following way: for a single student with a predicted grade point average of 2.0 the odds are two to one that his actual grade point average will be somewhere between 1.25 and 2.75; the odds are one to six that he will earn a grade point average less than 1.25. Anyone familiar with the normal distribution may use the standard error of estimate to compute "cut-off" points for any "odds" they wish to use.

All of the predictions, whether based on the four ACT sub-scales or the ACT composite, are statistically significant at the .01 level of confidence. The

statistical significance, however, is to a large extent determined by the sample size. Since all of the samples used in this study were fairly large, it is not surprising that significant results were obtained. The actual usefulness of a relationship is best indicated by the standard error of estimate and the absolute size of the multiple correlation coefficient (or product moment correlation coefficient for prediction from one variable).

In general, the predictions for individual course grades are more accurate than the predictions for grade point average. The single exception is for Speech 105. Even though the multiple correlation coefficient for grade point average is only the second highest (.33), the standard error of estimate indicates that the most accurate predictions can be based on this criterion, due to the relatively small standard deviation (.80). The higher coefficients observed in column three for the individual courses should be expected, since the reliability of an individual course grade is generally greater than the reliability of a grade point average computed from many different course grades. In general, a correlation of about .60 is the highest that might be expected when grades and grade point averages are the criterion. This is due to the "reliability limits" imposed on such criterion measures by varying tests, instructors, standards, etc. A coefficient ranging from .40 to .59 might be described as moderate or typical.

For comprehensive community junior colleges, there is no philosophical reason to expect or desire a high degree of predictability of grades and grade point averages from ability measures. For example, if a high multiple correlation coefficient indicates a strong relationship between ACT scores and grade point average, this could be interpreted to mean that grades are largely determined by the ability "in-puts" the students bring to the college. In other words, the "out-put" of the college is largely determined by the nature of the in-put, and not by what happens to the students after they enter the institution. If a weak relationship between ability measures and grade point average is indicated by a low correlation coefficient, this could be interpreted to mean that students of widely varying ability levels are channeled into programs where success, as indicated by grades and grade point averages, is predetermined only to a small extent by their entering ability levels. This could mean that the college is providing appropriate programs for students of different ability levels.

A low multiple correlation could also mean that there is not a linear relationship between the criterion, for example, grade point average, and the predictors. Further analysis will be undertaken to see if this might be the actual situation.

Table 1

Prediction of GPA and Course Grades from ACT Scores and High School Graduation Status

Criterion	N	Prediction from ACT Sub-Scales Weights for Scale						Correlation of ACT Composite			Grad minus Non-Grad	Mean Grade or GPA	Standard Deviation	Standard error of estimate based on Prediction from ACT sub-scales
		R	Eng	Math	SS	NS	Constant	r	Weight	Constant				
GPA	2228	.33	.03	.00	.01	.01	1.49	.31*	.05	1.50	-.058	2.27	.80	.75
Eng 101	1180	.47	.06	.01	-.03	-.01	.10	.43*	.10	.20	.096	1.25	1.06	.93
Comm 131	320	.39	.07	.00	.02	-.01	1.09	.32*	.07	1.14	.000	2.23	1.07	.98
Math 101	364	.47	.05	.09	.01	.01	-.95	.43*	.12	-.49	-.35	1.75	1.37	1.21
Math 115	135	.41	.03	.08	.03	.00	-.49	.37	.12	-.25	-.15	1.86	1.36	1.24
Bus 101	214	.36	.00	.04	.04	.03	-.28	.36	.11	-.41	-.99**	1.51	1.32	1.23
Bus 105	310	.39	.02	.02	.06	-.01	.72	.37	.09	.69	-.65**	2.20	1.12	1.03
Spe 105	225	.24	.03	.00	.03	-.02	1.42	.17*	.04	1.52	.42	2.17	1.11	1.07
Bio 115	342	.40	.04	.01	.03	.03	-.21	.39	.11	-.26	-.36	1.66	1.30	1.19
Chem 101	208	.51	.01	.07	.01	.02	-.99	.47*	.11	-.92	.30	1.28	1.17	1.00
Hist 101	1119	.51	.01	.01	.07	.01	.38	.48*	.11	.27	-.26	2.16	1.07	.92
SS 131	191	.56	.03	-.01	.07	.02	.55	.52*	.13	.38	-.76**	2.19	1.10	.91
Psy 105	492	.34	.03	.00	.02	.02	1.15	.33	.07	1.14	-.06	2.42	1.07	1.00

*Significantly less than R at .05 level

** Significant at .05 level